

WHAT IS CLAIMED IS:

1. A failure diagnosis apparatus for a throttle valve actuating device having actuating means for actuating a throttle valve provided in an intake system of an internal combustion engine and biasing means for biasing said throttle valve to a predetermined retention opening, said failure diagnosis apparatus comprising:

first control means for performing a feedback control of said throttle valve so that an opening of said throttle valve coincides with a first predetermined opening;

second control means for performing a feedback control of said throttle valve so that the opening of said throttle valve coincides with a second predetermined opening after said throttle valve is controlled to the first predetermined opening by said first control means; and

determining means for determining that said throttle valve actuating device has failed when the time period during which the opening of said throttle valve remains in a predetermined determination range including the second predetermined opening, is shorter than a predetermined time period during an operation of said second control means.

2. A failure diagnosis apparatus according to claim 1, wherein the predetermined retention opening is an opening at which said engine is operable even when said actuating means stops actuating said throttle valve.

3. A failure diagnosis apparatus according to claim 2, wherein the first predetermined opening is an opening at which said throttle valve is substantially fully closed, and the second predetermined opening is less than the predetermined retention opening and greater than the first predetermined opening.

4. A failure diagnosis apparatus according to claim 2, wherein the first predetermined opening is an opening which is greater than the predetermined retention opening, and the second predetermined opening is

greater than the predetermined retention opening and less than the first predetermined opening.

5. A failure diagnosis apparatus according to claim 1, wherein said second control means includes limiting means for limiting a control amount to be supplied to said actuating means when performing the feedback control to make the opening of said throttle valve coincide with the second predetermined opening.

6. A failure diagnosis apparatus according to claim 5, wherein said limiting means limits the control amount so that said throttle valve can be controlled to the second predetermined opening when said biasing means is normal, while said throttle valve cannot be controlled to the second predetermined opening when said biasing means is abnormal.

7. A failure diagnosis method for a throttle valve actuating device having an actuator for actuating a throttle valve provided in an intake system of an internal combustion engine and biasing members for biasing said throttle valve to a predetermined retention opening, said failure diagnosis method comprising the steps of:

a) performing a feedback control of said throttle valve so that an opening of said throttle valve coincides with a first predetermined opening;

b) performing a feedback control of said throttle valve so that the opening of said throttle valve coincides with a second predetermined opening after said throttle valve is controlled to the first predetermined opening; and

c) determining that said throttle valve actuating device has failed when the time period during which the opening of said throttle valve remains in a predetermined determination range including the second predetermined opening, is shorter than a predetermined time period when performing the feedback control in said step b).

8. A failure diagnosis method according to claim 7, wherein the

predetermined retention opening is an opening at which said engine is operable even when actuation of said throttle valve is stopped.

9. A failure diagnosis method according to claim 8, wherein the first predetermined opening is an opening at which said throttle valve is substantially fully closed, and the second predetermined opening is less than the predetermined retention opening and greater than the first predetermined opening.

10. A failure diagnosis method according to claim 8, wherein the first predetermined opening is an opening which is greater than the predetermined retention opening, and the second predetermined opening is greater than the predetermined retention opening and less than the first predetermined opening.

11. A failure diagnosis method according to claim 7, wherein a control amount to be supplied to said actuator is limited when performing the feedback control to make the opening of said throttle valve coincide with the second predetermined opening in said step b).

12. A failure diagnosis method according to claim 11, wherein the control amount to be supplied to said actuator is limited so that said throttle valve can be controlled to the second predetermined opening when said biasing means is normal, while said throttle valve cannot be controlled to the second predetermined opening when said biasing means is abnormal.

13. A computer program for causing a computer to carry out a failure diagnosis method for a throttle valve actuating device having an actuator for actuating a throttle valve provided in an intake system of an internal combustion engine and biasing members for biasing said throttle valve to a predetermined retention opening, said failure diagnosis method comprising the steps of:

a) performing a feedback control of said throttle valve so that an opening of said throttle valve coincides with a first predetermined opening;

b) performing a feedback control of said throttle valve so that the opening of said throttle valve coincides with a second predetermined opening after said throttle valve is controlled to the first predetermined opening; and

c) determining that said throttle valve actuating device has failed when the time period during which the opening of said throttle valve remains in a predetermined determination range including the second predetermined opening, is shorter than a predetermined time period when performing the feedback control in said step b).

14. A computer program according to claim 13, wherein the predetermined retention opening is an opening at which said engine is operable even when actuation of said throttle valve is stopped.

15. A computer program according to claim 14, wherein the first predetermined opening is an opening at which said throttle valve is substantially fully closed, and the second predetermined opening is less than the predetermined retention opening and greater than the first predetermined opening.

16. A computer program according to claim 14, wherein the first predetermined opening is an opening which is greater than the predetermined retention opening, and the second predetermined opening is greater than the predetermined retention opening and less than the first predetermined opening.

17. A computer program according to claim 13, wherein a control amount to be supplied to said actuator is limited when performing the feedback control to make the opening of said throttle valve coincide with the second predetermined opening in said step b).

18. A computer program according to claim 17, wherein the control amount to be supplied to said actuator is limited so that said throttle valve can be controlled to the second predetermined opening when said biasing means is normal, while said throttle valve cannot be controlled to the second predetermined opening when said biasing means is abnormal.